BEFORE THE

ILLINOIS COMMERCE COMMISSION

COMMONWEALTH EDISON COMPANY	)	
	)	
Annual Formula Rate Update and Revenue	)	
Requirement Reconciliation	)	No. 16-0259
Pursuant to Section 16-108.5 of the Public	)	
Utilities Act.	)	

PUBLIC

DIRECT TESTIMONY AND EXHIBITS

OF

ROBERT M. FAGAN AND MAXIMILIAN CHANG

ON BEHALF OF

THE PEOPLE OF THE STATE OF ILLINOIS

AG Exhibit 2.0

June 29, 2016

Material designated by Commonwealth Edison as confidential have been removed

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EXHIBITS

I. INTRODUCTION

Q. PLEASE STATE YOUR NAMES, EMPLOYER, AND PRESENT POSITIONS.

A. My name is Robert M. Fagan. I am a Principal Associate at Synapse Energy Economics, Inc., 485 Massachusetts Avenue, Cambridge, MA 02139.

My name is Maximilian Chang. I am a Principal Associate at Synapse Energy Economics, Inc., 485 Massachusetts Avenue, Cambridge, MA 02139.

Q. ON WHOSE BEHALF ARE YOU TESTIFYING IN THIS CASE?

A. We are testifying on behalf of the People of the State of Illinois ("the People"), represented by the Office of the Illinois Attorney General ("AG").

Q. PLEASE DESCRIBE SYNAPSE ENERGY ECONOMICS.

A. Synapse Energy Economics ("Synapse") is a research and consulting firm specializing in energy and environmental issues, including: electric generation, transmission and distribution system reliability, market power, electricity market prices, stranded costs, efficiency, renewable energy, environmental quality, and nuclear power.

Q. MR. FAGAN, PLEASE SUMMARIZE YOUR WORK EXPERIENCE AND EDUCATIONAL BACKGROUND.

A. I hold an MA from Boston University in Energy and Environmental Studies (1992) and a BS from Clarkson University (then Clarkson College) in Mechanical Engineering (1981). I have completed additional course work in wind integration, solar engineering, regulatory and legal aspects of electric power systems, building controls, cogeneration, lighting design and mechanical and aerospace engineering.

I am a mechanical engineer and energy economics analyst, and I have analyzed energy industry issues for more than 25 years. My professional activities focus on many aspects of the electric power industry, in particular:

- Economic and technical analysis of electric supply and delivery systems;
- Wholesale and retail electricity provision;
- Energy and capacity market structures;
- Renewable resource alternatives, including on-shore and off-shore wind and solar PV; and
- Assessment and implementation of energy efficiency and demand response alternatives.

I have expertise with respect to the complexities of, and the interrelationships between, the technical and economic dimensions of the electric power industry in the United States and Canada. My areas of focus include: wholesale energy and capacity provision under market-based and regulated structures; transmission use pricing, encompassing congestion management, losses, locational marginal pricing, and alternatives; financial and physical transmission rights; and transmission asset pricing (e.g., embedded cost recovery tariffs).

My experience includes in-depth knowledge of physical distribution and transmission network characteristics; related generation dispatch/system operation functions; technical and economic attributes of generation resources; regional transmission organization ("RTO") tariff and market rules structures and operation; and Federal Energy Regulatory Commission ("FERC") regulatory policies and initiatives, including those pertaining to RTO and independent system operator ("ISO") development and evolution. I also have

expertise with respect to the assessment of technical and economic dimensions of wind and solar power integration into utility power systems, and in utility demand side management and demand response impacts on the power system. My resume, which accurately reflects my background and experience, is included herewith as **AG Exhibit 2.1.**

Q. MR. CHANG, PLEASE SUMMARIZE YOUR WORK EXPERIENCE AND EDUCATIONAL BACKGROUND.

A. I hold a Master of Science degree from the Harvard School of Public Health in Environmental Health and Engineering Studies, and a Bachelor of Science degree from Cornell University in Biology and Classical Civilizations.

My experience is summarized in my resume, which is attached as **AG Exhibit 2.2**. I am an environmental engineer and energy economics analyst who has analyzed energy industry issues for more than seven years. In my current position at Synapse Energy Economics, I focus on economic and technical analysis of many aspects of the electric power industry, including: (1) utility reliability performance and distribution investments, (2) nuclear power, (3) wholesale and retail electricity markets, (4) energy efficiency and demand response alternatives, and (5) impacts of utility mergers and acquisitions.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. Commonwealth Edison ("ComEd" or "the Company") filed its annual formula rate update and revenue requirement reconciliation petition and supporting Direct Testimony on April 11, 2016. The AG retained Synapse to assist in its review of that submission. Our testimony specifically addresses the Company's proposed voltage validation project,

and generally addresses the Company's overall strategy on voltage optimization and data analytics.

Q. WHAT DATA SOURCES DID YOU RELY UPON TO PREPARE YOUR TESTIMONY AND EXHIBITS?

A. We relied primarily on the Company's Smart Grid Advanced Metering Annual Implementation Progress Report ("AIPR"), the Direct Testimony and exhibits of the Company's witnesses as well as the Company's responses to various data requests ("DR"). Certain of those responses are provided as exhibits attached to our testimony. In addition, we relied upon evidence and reports from AMI and Smart Grid proceedings of other utilities in which we have participated or which we have reviewed.

II. SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

Q. PLEASE SUMMARIZE YOUR CONCLUSIONS AND RECOMMENDATIONS REGARDING THE COMPANY'S VOLTAGE OPTIMIZATION VALIDATION PROJECT AND VOLTAGE OPTIMIZATION STRATEGY.

A. The ability to control voltage on a distribution system is not new technology, although it can be enhanced by advanced meter infrastructure ("AMI") and other "smart" distribution technology. We conclude that the investments proposed by the Company and the amount of money that has been spent thus far on voltage optimization have been unreasonably small. Given the opportunities afforded by the investments authorized under Section 16-108.5 of the Public Utilities Act[1] to modernize the distribution system, to reduce operating costs, and to save consumers money; we recommend that the Illinois

[1] 220 ILCS 5/16-108.5.

Commerce Commission ("ICC" or "Commission") review ComEd's 2015 and projected 2017 investments in light of what expenditures a prudent utility would make.

In the current formula rate update case, the Company is seeking to spend $4 million to validate a study, commissioned by ComEd and conducted by the Applied Energy Group ("AEG"), concerning a cost-effective voltage optimization strategy. The proposed validation project is limited to one substation and 19 feeders. This may not be sufficient for the Company to evaluate the breadth of voltage optimization benefits, challenges of the ComEd distribution system, and available solutions.

In order to be informed of the progress and possible challenges of voltage optimization, we recommend that the Commission direct ComEd to adopt a more comprehensive and robust validation study and expand upon the current documentation of the company's ongoing voltage optimization efforts as part of Metric 17 of the AIPR so that the Commission stays informed about the types of technology used and the results achieved from the validation study. We conclude that the Company's proposed, narrow validation study may limit prudent investments in cost effective technology that will reduce costs and save consumers money.

Q. PLEASE SUMMARIZE YOUR CONCLUSIONS AND RECOMMENDATIONS REGARDING THE COMPANY'S DATA ANALYTICS PROGRESS.

A. As a result of the multi-billion dollar investments authorized by Illinois law, the Company is in the process of installing "smart" meters and modern distribution equipment that collect ever more customer and system data. In February 2016, the ICC opened a Notice of Inquiry on the use of cloud computing for data analytics signaling a clear interest on the part of the Commission in how utilities are managing their data. It is

unclear what specific path the Company plans to follow to utilize the vast amounts of data becoming available on its system for operations as well as for customer engagement. While the Company has implemented several data analytics projects in recent years, the Company does not appear to have a documented and comprehensive data analytics strategy. We recommend that the Commission require ComEd to develop a long term plan to fully utilize the extensive data that is becoming available due to the installation of smart meters and modern distribution infrastructure. A long term plan is necessary to verify and encourage the development and integration of new data analytic strategies and solutions that would prudently complement the investments made by the Company to modernize its system and to complement its smart grid investments.

This information is required to assess the prudence of ComEd's expenditures in these areas and should be incorporated into the Company's ongoing reporting metrics included in its Annual Implementation Progress Reports and Infrastructure Investment Annual Updates.

Q. PLEASE EXPLAIN HOW YOUR TESTIMONY IS RELATED TO THE COMPANY'S ANNUAL FORMULA RATE PROCEEDINGS.

A. The Company's April, 2016 petition seeks to increase revenue requirements to $2.6 billion for 2017.[2] The issues that we raise herein are relevant to both current and future spending priorities and requirements. The actual dollar amounts that the Company has spent on the voltage optimization and data analytics issues are small relative to the overall rate case. However, these investments have long-term importance to prudent use of a modernized distribution system and to achieving operational savings and efficiencies

[2] Direct Testimony of Christine Brinkman, ComEd Ex. 1.0, at 4:68.

that should reduce customer charges going forward. In order to progress on both issues addressed in our testimony, the Company will need to develop and articulate multi-year strategies that will affect future investments and future annual rate proceedings.

III. BACKGROUND: VOLTAGE OPTIMIZATION

Q. PLEASE DEFINE THE CONCEPT OF VOLTAGE OPTIMIZATION IN YOUR TESTIMONY.

A. For the purposes of our testimony, we will adhere to the Company's definition of voltage optimization (VO):

> As described in ComEd's 2016 AIPR, Voltage Optimization ("VO") is a combination of Conservation Voltage Reduction ("CVR") and Volt-VAR Optimization ("VVO"). These programs are intended to reduce end-use customer energy consumption and peak demand while also reducing utility distribution system energy losses.[3]

More specifically, voltage optimization also encompasses the Company's operating transformer load tap-changers, line voltage regulators, and capacitor banks that can adjust voltage along a distribution circuit and compensate load power factor.[4] Coordinating volt-var control ("VVC") devices can achieve voltage profiles that meet the utility's operational objectives, including energy delivery efficiency, power quality, and reliability.[5] [6]

[3] ComEd Ex. 5.0, lines 858-861 (April 11, 2016).

[4] Department of Energy. *Energy Efficiency in Distribution Systems Impact Analysis Approach.* November 30, 2011. Slide 7. Available at https://www.smartgrid.gov/files/Distribution_System_Energy_Efficiency_17Nov11.pdf, hereafter DOE (2011).

[5] DOE (2011).

[6] var: voltage-ampere reactive. At a high level, var is the apparent power flowing through reactive load. This power results from current out of phase with voltage.

The Company defines voltage optimization as consisting of two aspects: Conservation Voltage Reduction (CVR) and VVC. Generally, CVR allows the utility to shift feeder voltage from the upper half of voltage requirements (i.e. 120 to 127 volts) to lower half (113 to 120 volts). Utilizing VVC and VO functionality to lower distribution voltages can result in energy savings, without causing customer voltages to fall below minimum operating limits.[7] Importantly, the resulting voltage optimization and corresponding energy reduction would not result in customers experiencing any changes in service since the voltage optimization occurs along the distribution line before the customer's meter. In addition, line losses are reduced. At the same time, consumers would benefit by using and paying for fewer kilowatt hours.

Q. HAVE UTILITIES INVESTIGATED VOLTAGE OPTIMIZATION GENERALLY?

A. Yes. Utilities have recognized the management of voltage for many years. In the early 1990s researchers recognized that voltage management could be a means of reducing energy usage.[8] While voltage reduction is an emergency method to shed load in PJM, [9] daily management of voltage across feeders is now possible and used by a number of utilities across the country. In recent years, voltage management studies have been updated to extrapolate potential nationwide energy savings.[10] A National Rural Electric Cooperative Association (NRECA) study based on data from rural electric cooperatives

[7] DOE (2011).

[8] http://www.osti.gov/scitech/servlets/purl/5402531/.

[9] ComEd notes that it has the ability to achieve a 1.3% load reduction in 30 minutes if required by the PJM regional transmission organization. http://www.pjm.com/~/media/documents/manuals/m13.ashx. Page 22.

[10] Schneider, KP. et al. *Evaluation of Conservation Voltage Reduction (CVR) on a National Level.* July 2010. Available at http://www.pnl.gov/main/publications/external/technical_reports/PNNL-19596.pdf.

with distribution automation technology found that CVR results in net savings for customers by lowering overall bills, even though rates increased.[11] While the Company claims not to be in possession of reports and studies, a quick search on the EPRI website identifies a number of utility specific voltage optimization studies readily available to the Company.[12]

Q. PLEASE DESCRIBE SOME VOLTAGE OPTIMIZATION EFFORTS AT OTHER UTILITIES.

A. We understand that a number of utilities in addition to the studies previously mentioned have begun to implement limited deployment of voltage optimization programs. These efforts include, but are not limited to:

- PEPCO in Maryland has implemented voltage control devices for 13 substations since 2013.[13]
- Baltimore Gas and Electric has enabled voltage control for 19 substations, with an eventual near-term target deployment of about 20 percent of its feeders.[14]
- Avista Utilities conducted a CVR evaluation study based on deployment of CVR and AMI technologies across 17 substations and 71 feeders.[15]

Q. DOES COMED HAVE THE ABILITY TO REDUCE VOLTAGE FOR ITS DISTRIBUTION SYSTEM CURRENTLY?

[11] National Rural Electric Cooperative Association, Cooperative Research Network. *Costs and Benefits of Conservation Voltage Reduction CVR Warrants Careful Examination Final Report.* May 2014. Page 16.

[12] ComEd response to data request AG 6.03.

[13] PEPCO, Direct Testimony of Karen Lefkowitz. Maryland PSC Case 9418, April 19, 2016, at 70:10-12.

[14] BGE. Direct testimony of Michael Butts. Maryland PSC Case 9406. November 6, 2015. At 58:11-14.

[15] Stern, F., *et al*., *Conservation Voltage Reduction- On the Other Side of the Meter: An Evaluation Case Study.* 2015 International Energy Program Evaluation Conference. Long Beach, CA.

A. Yes. The Company has the ability to reduce voltages on its system in the event of unplanned emergency events.[16,17] This is not within the scope of the voltage optimization validation project nor the issue of the testimony. It merely is to point out that voltage reduction may be temporarily, albeit bluntly, applied across the Company system in its current state. At issue is finding the appropriate technologies and investments to implement voltage optimization where prudent on the Company's system in a more controlled and systematic manner so that the Company can deliver less electricity to end-users by controlling voltage.

Q. DOES THE COMPANY CURRENTLY DOCUMENT VOLTAGE AND VAR CONTROL ACITIVITIES?

A. Yes, but the Company reporting of its voltage and var control activities is limited to the number of feeders that use sensing from an AMI meter as part of a voltage regulations scheme.[18] The Company's metric 17 merely states that 13 out of 5,456 feeders are part of a voltage regulation scheme. No change has been reported in this metric in the annual reports.

Q. DOES THE COMPANY CURRENTLY CONSIDER VOLTAGE OPTIMIZATION FOR DISTRIBUTION PLANNING PURPOSES?

A. No. The Company asserts that it is too early to consider voltage optimization in its planning processes since there are no results of the voltage optimization validation project.[19] Given the amount of time that has elapsed since ComEd first identified VO as a

[16] ComEd ComEd response to data request IIEC 2.11 Attach 1 (confidential) page 6.

[17] ComEd response to data request AG 10.09, Attachment 1 (confidential), page 16.

[18] ComEd. 2016 AIPR. Page 110.

[19] ComEd response to data ComEd ComEd response to data request AG 10.10.

benefit of grid modernization in 2009 in Docket No. 09-0407[20] and the Company's apparent planning for VO in connection with legislation before the Illinois General Assembly, the Company's lack of progress is troubling and raises questions about why it is not more actively evaluating this apparently prudent, cost saving technology.[21]

Q. HAVE COMED'S SISTER UTILTIES REPORTED VOLTAGE OPTIMIZATION EFFORTS TO THEIR RESPECIVE COMMISSIONS?

A. Yes. Both Baltimore Gas and Electric ("BGE") in Maryland and PECO Energy Company ("PECO") in Pennsylvania report energy savings attributable to their conservation voltage reduction efforts. BGE reports CVR savings as part of its EmPower Maryland filings under MD PSC commission order 85649. The BGE Empower Maryland filings are available on the Maryland PSC Commission website under Case 9154.[22] In BGE's 2015 semi-annual report for the third and fourth quarters of 2015, BGE notes that it is in the process of evaluating and comparing a full year's worth of data to pre-deployment baseline and that BGE will release its findings in the 2016 semi-annual first and second quarter report.[23] PECO implemented its substation CVR program in 2011 or Program Year 2 under the Act 129 statute.[24] The PECO program reports achieving gross savings of 320,372 MWh.[25]

[20] In ICC Docket No. 09-0407, ComEd identified voltage control or "dynamic voltage management," as a key benefit resulting from distribution automation. It identified up to one million dollars in savings for 2 substations and 19 12.47 kV feeders. See ComEd Ex. 5.0 at 21-25 and ComEd Ex. 6.2, Navigant Consulting, Value Assessment: Distribution Automation and Conservation Voltage Reduction Programs, at 8, 23-24.

[21] http://openstates.org/il/bills/99th/SB1585/.

[22] Available at http://www.psc.state.md.us/search-results/?keyword=9154&search=all&search=case&x.x=0&x.y=0.

[23] Baltimore Gas and Electric. *BGE's Semi-Annual Report for Third and Fourth Quarters-July 1 through December 31, 2015 in Case 9154.* February 1, 2016. Page 60.

[24] PECO. *Energy Efficiency and Conservation Program Final Annual Report June 1, 2012 through May 31, 2013.* Penn. PUC Docket M-2008-2069887, November 13, 2013, page 145. Available at http://www.puc.state.pa.us/pcdocs/1260111.pdf

[25] *Id*. Table 9-1. Page 145.

Q. DID COMED PROVIDE INFORMATION REGARDING CVR ACTIVITIES OF ITS SISTER UTILITIES?

A. No. When asked about its awareness of CVR or voltage optimization activities of its sister utilities, the Company only indicated that it was "generally aware" that its sister utilities were "considering" voltage optimization projects.[26] The Company did not disclose that its sister utilities were already reporting savings to their respective commissions. At the same time, the Company indicated that it communicates with its sister utilities on subject matters including voltage optimization.[27] We do not know the extent and depth of the communication between ComEd and its sister companies that have adopted voltage optimization. In response to AG 6.03, the Company did not produce materials resulting from communications with its sister utilities.[28]

Q. DO YOU FIND THIS INCONSISTENCY PROBLEMATIC?

A. Yes, we find it puzzling that the Company did not provide more details regarding the activities of its sister utilities when information is publicly available. Both BGE and PECO would appear to have useful information for ComEd as it considers its voltage optimization validation project. For instance, an article in *T&D World* details the lessons learned from the BGE CVR pilot, including instances where feeder loads actually increased with CVR.[29] We encourage ComEd to communicate with its sister utilities since their experiences would inform ComEd on the design and evaluation CVR technologies and strategies.

[26] ComEd response to data request AG 6.01.

[27] ComEd response to data request AG 9.02.

[28] ComEd response to data request AG 6.03.

[29] http://tdworld.com/distribution/bge-pilots-voltvar-tria. Attached as AG Exhibit 2.3.

Q. DID THE COMPANY STATE THE PURPORTED BENEFITS IN VOLTAGE OPTIMIZATION IN ITS 2012 ADVANCED METERING INFRASTRUCTURE PLAN?

A. The 2012 Smart Grid Advanced Metering Infrastructure Deployment Plan touted improved ability to manage the distribution system as a benefit of its AMI investment.[30] Specifically the Company noted that its AMI project would:

- Transform Delivery System Operations
- Assist in voltage control (2012, page 12)
- Monitor meter events (low voltage) (2012, page 30)
- Track the number and percentage of distribution lines using sensing from an AMI meter as part of ComEd's voltage regulation scheme. (2012, 39)

Q. HAS THE COMPANY REFERRED TO THE BENEFITS OF VO IN ANY OTHER CONTEXT?

A. Recently, we understand that ComEd has supported Illinois legislation to make its investments in VO mandatory and consider VO as part of its energy efficiency plans. In Senate Bill 1585, Senate Amendment 3, introduced on May 12, 2016, ComEd is directed to include "cost-effective voltage optimization measures" in its energy efficiency plans.[31] In a PowerPoint presentation explaining the legislation, called the Next Generation Energy Plan, ComEd indicated it could invest in VO from 2017 through 2024, at $75 million per year, with a first and last year investment of $25 million for a total proposed investment of $500 million.[32] Thus it appears that the Company is willing to invest in VO prior to the completion of the VO validation study if the General Assembly were to adopt the proposed legislation.

[30] ComEd 2012 AMI Plan.

[31] http://www.ilga.gov/legislation/99/SB/09900SB1585sam003.htm at page 112-113.

[32] Exelon Generation. *Next Generation Energy Plan: Financial and Customer Impacts.* May 2016. Slide 14.

Q. WHAT IS THE SIGNIFICANCE OF THE COMPANY'S LEGISLATIVE EFFORTS?

A. On the one hand the Company is proposing to spend $4 million on its validation project for 2016 and states that it is not considering deployment of VO because a validation study has not been completed.[33] On the other hand, the Company has sought legislative approval to spend $500 million for full implementation of voltage optimization without reference to findings from the validation project described below. The Company has not articulated a strategy to examine what voltage optimization technology or substations and feeders would be most cost effective and the validation project it proposes is too limited to provide meaningful information to assist in the implementation of VO.

IV. APPLIED ENERGY GROUP REPORT

Q. HAS THE COMPANY SURVEYED A POSSIBLE VOLTAGE OPTIMIZATION IMPLEMENTATION PLAN FOR ITS SERVICE TERRITORY?

A. Yes. As noted above, the Company commissioned AEG to conduct an assessment of VO in 2015. AEG is not currently retained by the Company.[34] Nor has the company requested an update to the report.[35]

Q. WHAT DID THE AEG REPORT FIND?

A. The 2015 AEG report outlined a $425 million plan and a $574 million plan with benefit to cost ratios of 2.2 and 2.3 respectively.[36] The summary results taken from Table 1 of the AEG report are presented below:[37]

[33] ComEd response to data request AG 6.13.

[34] ComEd response to data request AG 6.04.

[35] ComEd response to data request AG 6.05.

[36] AEG. *Voltage Optimization (VO) Feasibility Study: Final Report.* March 9, 2015 ("AEG ").

Table 1 - Summary of Project Results

	Plan A	Plan B
Total VO Savings Potential		
- Energy (MWh-yr)	1,350,371	1,912,952
- Peak Load (MW)	257	364
Total VO Installed Costs	$425,466,877	$574,232,508
VO Program TRC	2.20	2.30
Levelized Cost of Energy ($/kWh)	$0.0193	$0.0185
Number of Viable Feeders	2,890	2,890
Number of Viable Substations	515	515
Average Energy Savings (MWh-yr)		
- per viable feeder	467	662
- per viable substation	2,624	3,718
Average VO Cost		
- per viable feeder	$147,222	$198,699
- per viable substation	$826,902	$1,116,030

These high level summary results suggest that the analyzed scenario would provide net benefits to ComEd ratepayers even considering the significant investments analyzed by AEG.

Q. DOES THE AEG REPORT SUGGEST THAT EVERY SUBSTATION AND FEEDER CAN UNDERGO VOLTAGE OPTIMIZATION?

A. No, voltage optimization may not be appropriate for every substation and feeder in the ComEd system. The AEG report identified that not-viable feeders include low voltage feeders, primary network feeders, and/or large commercial loads. The AEG report found that approximately 346 of the 542 screened substations are viable candidates for voltage optimization.[38] On a feeder basis, the 346 substations represent 2,890 feeders.[39] This is a little more than half of the 5,650 feeders in the ComEd service territory.

Q. DID AEG RANK THE 346 SUBSTATION IN ITS ANALYSIS?

[37] The 515 viable substations summarized by ComEd are slightly different from the 542 substations screened by AEG in their study.

[38] AEG. 2015. Table 36. A-102. The AEG study excluded 264 substations from their analysis.

[39] AEG. 2015. A-11

A. Yes, as part of Appendix A of its report, AEG provided a ranking of the 346 viable substations screened in its analysis based on AEG's benefit to cost ratio analysis. We note that AEG identified 73 substations where its analysis determined the benefit to cost ratio to be greater than 4.0. We also note that the AEG report identified 46 substations that had a benefit to cost ratio of less than one.[40]

Q. PLEASE EXPLAIN THE SIGNIFICANCE OF THE 73 SUBSTATIONS WHERE THE BENEFIT TO COST RATIO EXCEEDED 4.0.

A. The significance of the 4.0 benefit to cost ratio is not the ratio in and of itself. The significance is the number of substations, 73, that show such a significant benefit. The AEG report findings suggest that there is a population of substations and feeders where voltage optimization could provide at least 4 times the benefits relative to costs. Now that these highly valuable projects have been identified, the Company should focus on implementing voltage optimization on this population of "high benefit" substations initially.

ComEd is not taking this approach. Instead, the Company has proposed another study of a single substation (TSS Hayford) with a much lower benefit to cost ratio of 2.06. The Company should design and implement a different voltage optimization solution or evaluation study for the 73 substations with a reported benefit cost ratio of at least 4.0. Its current approach tests a single substation with significantly less potential and effectively leaves meaningful benefits untested and unrealized for an indefinite period.

[40] AEG. 2015. Appendix A.

Q. SEPARATE FROM THE AEG REPORT, HAS THE COMPANY GIVEN ANY INDICATION OF THE SCOPE AND DURATION OF THE EFFORT FOR FULL SCALE VOLTAGE OPTIMIZATION DEPLOYMENT?

A. Yes, the Company has preliminarily indicated that it currently believes that full voltage optimization deployment would take eight years and encompass 500 substations.[41] However, the Company has made no determination of the most appropriate technology or its cost. Moreover, it is not known if the Company will ultimately proceed with a voltage optimization plan similar to the scope envisioned in the AEG report.

V. VOLTAGE OPTIMIZATION VALIDATION PROJECT

Q. PLEASE SUMMARIZE YOUR ASSESSMENT OF THE COMPANY'S PROPOSED VOLTAGE OPTIMIZATION VALIDATION PROJECT.

A. In this proceeding, the Company proposes to conduct a validation project for one substation and 19 feeders on its system. This is one substation out of the 346, or 0.2% of the potential substations screened in the AEG report and is within the group of 13 substations with benefit cost ratios between 2.0 and 2.10.[42] This validation study is so limited that it cannot be applied to the conditions of hundreds of substations and thousands of feeders and therefore is not a prudent expenditure of funds. Given the complexities and challenges surrounding voltage optimization and possible technology solutions, the Commission should require ComEd to expand upon its current voltage and var control metric (Metric 17) reporting to ensure that the Company's voltage optimization efforts are prudent in terms of planning, cost and realization of benefits.

[41] ComEd response to data request AG 6.25, Supplemental Attachment 1 (Confidential) Page 2 (confidential designation removed by agreement).

[42] On a feeder basis, the nineteen feeders represent less than 0.6% of the 2,890 viable VO feeders.

Q. PLEASE DESCRIBE THE COMPANY'S PROPOSED VOLTAGE OPTIMIZATION PROJECT PLAN.

A. The Company is planning a validation study costing $4 million to study one substation and 19 feeders.[43] This is in contrast to the validation project recommended by AEG, which covered two substations and 8-12 feeders at a cost of $2 million.[44] While the AEG recommendation is also quite limited, it is significant that it would cover twice the number of substations at half the cost. At this point the Company has only tentatively identified the substation, TSS 33 Hayford for validation.[45] No vendor or technology solution has been selected.[46] [47] The Company stated that it selected the substation because it is representative of the ComEd distribution system.[48] Customers served by this substation have smart meters installed, which may aid in the validation project.[49] In addition, the Company noted that because there is less than 100 kW of distributed generation on the proposed feeders, the Company anticipates that the presence of distributed PV will have no impact on the voltage optimization validation project.[50] By ignoring distributed generation impacts, the Company is losing an opportunity to incorporate the impacts of distributed generation upon voltage optimization strategies. Since the validation project is limited to a single substation, the Company is also losing the opportunity to assess VO potential in areas where AEG found more substantial savings potential.

[43] ComEd response to data request AG 6.10.
[44] ComEd. *2015 AIPR Progress Report Appendix A*. A-13
[45] ComEd response to data request AG 6.10.
[46] ComEd response to data request AG 6.08.
[47] ComEd response to data request AG 6.09.
[48] ComEd response to data request AG 6.10 Supplemental.
[49] ComEd response to data request AG 9.01.
[50] *Id.*

Q. IS THE VALIDATION PROJECT ON SCHEDULE?

The timeline of the proposed validation project is presented below from the 2016 AIPR.[51] To date, ComEd has not met several of the milestones identified, including the selection of a vendor (Q2/2016).

VO Validation Project Milestones & Timeline	End Date
VO Application	
Issue RFP for Voltage Optimization Vendor Application	Q1/2016
Evaluate/Select/Award Voltage Optimization Vendor Application	Q2/2016
Application Development with VO Vendor	Q2/2016
Voltage Optimization System Integration & Commissioning	Q4/2016
Substation/Feeder Design Phase	
Select Substations & Feeders for VO Pilot/Validation Deployment	Q2/2016
Develop PDs for Validation Substation & Feeder Enhancements	*Q2/2016*
Develop Engineering Designs for Substation & Feeder Enhancements	*Q2/2016*
Construction Phase	
Procure Major Materials (Capacitors, Regulators, Relays, & Controllers	Q3/2016
Construct Substation & Feeder Enhancements	Q4/2016

Q. IS THE COMPANY EVALUATING MULTIPLE VOLTAGE SOLUTIONS FOR THE VOLTAGE OPTIMIZATION VALIDATION PROJECT?

A. Yes, in the Company's supplemental response to data request AG 6.08, the Company noted that it has received multiple responses to its RFP that represent a range of voltage optimization solutions.[52, 53] Some are data algorithm based, some are smart meter based.[54] Importantly, the range of possible solutions suggests that the Company's focus on one substation may be insufficient to fully and fairly evaluate voltage optimization options and solutions comprehensively.[55] The Company's RFP is restricted to one substation (Hayford), and therefore limits opportunity to evaluate different approaches

[51] ComEd. *2016 AIPR Progress Report Appendix A* . Page A-11.
[52] ComEd response to data request AG 6.08 Supplemental.
[53] ComEd response to data request AG 9.04.
[54] ComEd response to data request AG 9.03.
[55] ComEd response to data request AG 7.13.

for various environments.[56] Curiously, the RFP also requests pricing for full deployment thus suggesting that the Company will seek a single solution and potentially eliminating other viable solutions, notwithstanding that the Company has received proposals that reflect multiple approaches, including "model based, rule based, and measurement based approaches."[57] The Company did not provide copies of responses to the RFPs due to vendor objections, so specific proposals cannot be evaluated at this time.

Q. WHY WOULD IT BE IMPORTANT TO EVALUATE MULTIPLE VOLTAGE OPTIMIZATION SOLUTIONS?

A. The Company represents that its distribution system includes 90,000 miles of distribution lines, 1,300 substations, and 3.8 million residential and commercial customers.[58] Moreover, the ComEd service territory encompasses:

- Urban Chicago
- Suburban Chicago
- Industrial Customers
- Rural customers
- Radial feeders
- Network feeders

These different characteristics suggest that there may be multiple voltage optimization challenges and solutions needed to effectively address the Company's requirements. For example, there are approaches driven by data analytics, approaches using capacitor banks and load tap changers, and approaches that incorporate batteries and distributed generation. Further, ComEd has installed AMI in about 44% of its customer premises, so a lack of AMI should not restrict the Company's validation project options.[59]

[56] ComEd response to data request AG 6.5 Supplemental Attachment 1, Attached as AG Exhibit 2.10.
[57] ComEd response to data request AG 6.25 Supplemental 2.
[58] https://www.comed.com/documents/newsroom/overview_fact_sheet.pdf.
[59] ComEd. 2016 AIPR. Page 13.

Q. HAS THE COMPANY INDICATED THAT IT WILL IMPLEMENT MULTIPLE VOLTAGE OPTIMIZATION STRATEGIES?

A. At this point, we have not seen anything to suggest that the Company would favor only one solution over another solution. However, we are concerned that the scope of the validation project is too limited and that by focusing on a single substation it will effectively preclude the validation of other possible voltage optimization solutions, particularly as vendors were asked to describe their capability and pricing for full deployment.

Q. EARLIER YOU DISCUSSED THE COMPANY'S VOLTAGE OPTIMIZATION VALIDATION PROJECT. IS THE COMPANY'S TENTATIVELY SELECTED SUBSTATION IDENTIFED BY AEG?

A. Yes. The AEG ranks the TSS 33 Hayford substation at 195 out of 346, with a benefit to cost ratio of 2.06.[60]

Q. DO YOU FIND THE RANKING OF THE HAYFORD SUBSTATION PROBLEMATIC?

A. On the one hand, we have no reason to disagree with the Company's characterization that the Hayford substation is representative of the ComEd system and that the voltage validation project will hopefully provide useful insight for the Company.[61] Our concern is that there are a large number of other substations where the Company could explore other possible voltage optimization solutions and test whether it can achieve the greater savings for consumers identified by the AEG Report.

[60] AEG. 2015. Page 114

[61] ComEd response to data request AG 6.10 Supplemental

Q. WHAT IS YOUR CONCLUSION ABOUT THE $4 MILLION VALIDATION STUDY PROJECTED FOR 2016?

A. We find that the single substation, 19 feeder scope of the validation study is insufficient to prudently and properly evaluate and validate the appropriate technology and savings available from VO. It is simply not prudent to limit the study when the range of substation savings potential, of feeder lengths, types, and conditions, and of geography (urban, suburban, rural) is so great. A prudent study may be more costly, but it would also be more meaningful and would test whether the optimistic projections in the AEG report can be realized.

Q. WHAT DO YOU RECOMMEND?

A. We recommend that the Commission direct ComEd to adopt a more comprehensive and robust validation study and expand upon the current documentation of the company's ongoing voltage optimization efforts as part of Metric 17 of the AIPR so that the Commission can be informed about the types of technology used and the results achieved from the validation study. We conclude that the Company's proposed validation study is not prudent because it is too limited to provide the information necessary to enable the Company to fairly and carefully review all voltage optimization options, and act on options that can result in consumer savings. The Company should not short-change prudent investments in cost effective technology that will reduce costs and save consumers money.

Q. WOULD COMED BE MADE "WHOLE" FOR ANY FUTURE COSTS IT MAY INCUR TO DEVELOP A MORE COMPREHENSIVE VOLTAGE OPTIMIZATION VALIDATION STUDY FOR THE BENEFIT OF RATEPAYERS UNDER CURRENT RATEMAKING PROCEDURES

A. Yes. It is our understanding that all incremental distribution expenses and distribution system capital investments that are incurred by ComEd in the future, and that are recorded in the Company's FERC Form 1, would be eligible for full recovery through annual formula rate update calculations. We also understand that any delay in the recovery of potentially higher overall costs caused by an expanded (or accelerated) Voltage Optimization validation project will also be compensated because of the interest ComEd is allowed to add to its reconciliation revenue requirement.

VI. DATA ANALYTICS

Q. PLEASE SUMMARIZE YOUR FINDINGS AND RECOMMENDATIONS ON DATA ANALYTICS.

A. ComEd is in the midst of a major modernization effort, installing "smart" meters and automated distribution equipment. As a result of this effort, the grid is producing large amounts of data, from meter operation to grid operations. In theory, this vast amount of system data can be used to cut costs and enhance system operations. While the Company has implemented several data analytics and cloud computing solutions, there does not appear to be an overall data strategy. The Company has implemented various projects; however, merely implementing discrete projects is not in and of itself a strategy. Ad hoc or niche data solutions that fail to take greater advantage of opportunities for efficiency and cost savings may not be prudent in the absence of a comprehensive strategy to make data actionable.

The Company noted in its 2012 AMI Implementation Plan that the AMI project had the potential to enhance data collection, analysis, and communication capabilities.[62] However, despite the availability of new data, the Company has not developed an approach to how to use the data to enhance operations and become more efficient.

We recommend that the Commission require ComEd to develop a long-term plan to fully utilize the extensive data that is becoming available due to the installation of smart meters and modern distribution infrastructure. A long-term plan is necessary to verify and encourage the development and integration of new data analytic strategies and solutions that would prudently complement the investments made by the Company to modernize its system and to complement its smart grid investments.

Q. HOW DOES THE COMPANY DEFINE INFORMATION TECHNOLOGY?

A. The company broadly defines information technology as follows:

> ComEd defines information technology package of services as a bundle of integrated information technology hardware or software solutions designed to support specific business initiatives and achieve desired outcomes.[63]

In addition, the Company indicates that its information technology work reflects a broad range of effort on the part of internal ComEd personnel, Exelon Business Service Company personnel, and outside contractors.[64]

Q. PLEASE DEFINE THE CONCEPT "DATA ANALYTICS" AS USED IN YOUR TESTIMONY.

A. For the purposes of our testimony, we will adhere to the Company's definition of data analytics. The Company "defines data analytics as the tools and techniques used to

[62] .2012 AMI Implementation Plan, page 53.

[63] ComEd response to data request AG 7.01.

[64] ComEd response to data request AG 7.03.

understand and forecast business outcomes by analyzing the relationships among data."[65] The tools for data analytics incorporate both on-premise and off-premise (e.g. cloud computing) solutions. These solutions should be part of the Company's overall information technology efforts.

Q. HOW DOES THE COMPANY ADDRESS BUSINESS INTELLIGENCE/ DATA ANALYTICS ISSUES?

A. In response to data requests, the Company stated that:

> … data analytics tools are not researched and managed by a central department at ComEd but rather by subject matter experts in different functional areas. …
>
> ComEd defines data analytics as the tools and techniques used to understand and forecast business outcomes by analyzing the relationships among data. Potential business intelligence and data analytics opportunities and initiatives have been, and remain today, under study across multiple departments at ComEd, BGE, and PECO.[66]

The Company, in response to the question whether the Company is aware of data analytic programs underway or contemplated by its affiliate utilities, BGE and PECO, referred to the concept of "Business Intelligence and Data Analytics (BI/DA)" which is a "system of tools and technologies that fit together to assemble, transform, display and analyze data collected from a variety of sources."[67] The Company also attached an Institute of Electrical and Electronics Engineers (IEEE) presentation entitled "Data Analytics: Putting Smart Grid Data to Work," by Carol Bartucci, the Chief Information Officer for ComEd and the VP of IT for Exelon Corporation ("Exelon"), addressing business

[65] ComEd response to data request AG 6.26.

[66] ComEd response to data request AG 6.26.

[67] *Id.*

intelligent/ data analytics across the Exelon family of utilities.[68] While the presentation is not explicitly an Exelon or ComEd corporate document, the presentation at a high level and publicly, identifies data analytics as an opportunity across the Exelon business units to analyze and utilize data to improve operations.[69] Specifically, the presentation outlines Exelon's framing of the business intelligence/data analytics issue as:

> The advancement of technology solutions and products around data analytics combined with the deployment of smart meters provides the Exelon Utilities with the ability to develop a business intelligence (BI) and data analytics (DA) strategy that can yield improvements in operational excellence and insights into the evolving utility model. What is the right approach (level of investment, sequencing, technical set-up, operating mode and level of convergence) across OpCos to realizing that value?[70]

Moreover, the presentation also recognizes the opportunity as:

> Rapid industry evolution requires us simultaneously to optimize performance, transform the utility business model and cultivate new sources of revenue. Mastery over business intelligence and data analytics related to performance and evolving markets will be a competitive advantage.
> At the same time, the state of the BI/DA market is extremely fluid, there are no clear winning technologies or solutions across the utility industry and the operating and governance models used in the industry are immature. This places a premium on BI/DA strategies that offer optionality.[71]

The presentation articulates eight guiding principles for business intelligence/data analytics strategies.[72] These principles are then applied across five functional domains: AMI, Grid (T&D), Smart Energy Services, Customer Experience, and Business

[68] ComEd response to data request AG 6.26, Attachment 1. Attached as AG Ex. 2.4.

[69] *Id.*, Slide 3 of 11.

[70] *Id.*, Slide 3 of 11.

[71] *Id.*, Slide 3 of 11.

[72] *Id.*, Slide 4 of 11.

Support.[73] The presentation includes a summary model of a dynamic asset health process using "static data" and "dynamic data," to obtain, e.g., system health reports, automated notifications to engineering, and field data.[74]

Q. ARE YOU CONCERNED THAT THE COMPANY HAS PRESENTED THESE GUIDELINES IN A POWERPOINT PRESENTATION FORMAT?

A. While the PowerPoint presentation is informative and attributed to ComEd's CIO and Exelon's VP of IT, it is not a ComEd management standard, policy, report, rule or other binding document. Further, it only summarizes overall aspirations and at a high level. The other responses and documents provided by ComEd do not include additional information about how ComEd's activities conform to the presentation's discussion of data analytics and convergence across the Exelon operating companies.

Q. HAS THE COMMISSION NOTED THE IMPORTANCE OF DATA ANALYTICS?

A. Yes, the Commission issued a Notice of Inquiry (NOI) on Cloud Computing in February, 2016 where it noted the potential of data analytics associated with the Company's modernization and smart meter investments.[75] Specifically, the Commission stated:

> … a shift to the cloud can enable both utilities and customers to leverage the economic and environmental value of the smart grid by aggregating systems to analyze the relevant data, develop new products and programs to help customers reduce their energy bills, and help utilities to better manage the power infrastructure.[76]

Q. DID ANY PROPONENT OF CLOUD COMPUTING QUANTIFY THE BENEFITS OF DATA ANALYTICS TO EXELON IN THE NOI?

[73] *Id.*, Slide 5 of 11.

[74] *Id.*, Slide 11 of 11.

[75] Available at https://www.icc.illinois.gov/NOI2016.aspx.

[76] ICC. 16-NOI-01, February 10, 2016. Page 2.

A. Yes, one vendor, C3 IoT, provided a McKinsey and Company assessment of functions and savings to Exelon from smart grid analytics, dated March 1, 2013, in its NOI response.[77] The McKinsey analysis found that smart grid analytics could result in a value of $221 million per year for ComEd.[78] While the assumptions for inputs and outputs used in the McKinsey analysis are not known, the report does suggest that Exelon and ComEd should take a serious look at an overall data analytics strategy that could result in substantial savings for customers.

Q. DOES THE COMPANY STATE THAT IT FAVORS CLOUD-BASED APPROACHES OVER ON-PREMISE APPROACHES TO DATA ANALYTICS?

A. In this docket the Company states that it is agnostic to data analytic solutions.[79] More broadly the Company states that it considers a range of factors in order to choose the best solution to address its business needs.

Q. IS THIS CONSISTENT WITH THE COMPANY'S POSITION IN THE COMMISSION'S NOTICE OF INQUIRY ON CLOUD COMPUTING?

A. Generally, it appears that the Company is agnostic to cloud or on-premise solutions and will evaluate data analytic solutions based on the needs of the Company and the specific situation.[80]

Q. AS A COURSE OF BUSINESS, DOES THE COMPANY TRACK THE NUMBER OF CLOUD COMPUTING PROJECTS?

[77] McKinsey and Company. *Value of Smart Grid Analytics for Exelon.* March 1, 2013. Available athttps://www.icc.illinois.gov/downloads/public/McKinsey%20-%20Exelon%20Smart%20Grid%20Analytics%20Value.pdf.

[78] *Id*., Slide 8.

[79] ComEd response to data request AG 7.10.

[80] ComEd. *Reply Comments of Commonwealth Edison Company.* Docket 16-NOI-01. May 27, 2016. Page 4.

A. The Company does track the number of cloud computing project with caveats. Specifically, the Company states:

> ComEd does not distinguish between cloud and on-premise solutions in its general ledger or a separate sub-ledger as it has no business reason to do so. As such, a distinct list of "cloud solutions" used throughout ComEd is not readily available. ComEd evaluates each IT solution to determine what solution is most appropriate under the specific circumstances.[81]

Notwithstanding the previous statement, the Company did provide a list of 21cloud-based solutions implemented since 2006.[82] Taken together, these projects total $32 million over the last ten years.[83]

Q. DOES THE SPENDING CONCERN YOU?

A. While we have no basis to question the prudency of the specific investments in this proceeding, we do not have any information to determine if these individual projects are consistent with an overall business intelligence/ data analytics strategy. The projects appear to address limited and discrete needs. When asked about its business intelligence and data analytics strategy, ComEd produced the PowerPoint presentation discussed above, and a May 1, 2010 Exelon Information Technology Procedure entitled Develop Exelon IT Strategic Plan.[84] No explicit plan or strategic approach was identified for ComEd.

Q. DID COMED PRODUCE ANY OTHER DOCUMENTS THAT INDICATED A MORE COMPREHENSIVE APPROACH TO DATA ANALYTICS?

[81] ComEd response to data request AG 4.01.

[82] ComEd response to data request AG 4.01, Attach 1 Confidential (confidential designation removed by agreement).

[83] *Id*.

[84] ComEd response to data request AG 11.01, Attachment 2 Confidential.

A. Yes. ComEd identified and produced two documents concerning approaches to data analytics. One is an RFP issued in 2013 by Exelon entitled "Advanced Meter Infrastructure Business Intelligence/Data Analytics – *Functional Requirements*."[85] That document describes each of the Exelon utility's AMI roll-out, and seeks a vendor able to provide services to "transform raw data into actionable information."[86] Specifically, the document states:

> Pilots of analytics engines and deployment of niche solutions have demonstrated the value of smart grid analytics to a variety of business units throughout the company. While value has been demonstrated, in order to achieve the full potential and be able to operationalize these analytics, a long term solution needs to be implemented. The ultimate goal for the Business Intelligence / Data Analytics initiative is to do just that, implement a solution that is able to integrate disparate forms of data, both internal and external to the company, and provide an analytic engine to turn the data into actionable information to streamline business processes.

The document also refers to the Exelon "Meter Data Services Business Intelligence / Data Analytics convergence project," which was intended to make Business Intelligence / Data Analytics available to Exelon Utilities that were "poised to use the actionable information."[87] A copy of this document is attached as AG Exhibit 2.5.

Q. WHAT IS THE OTHER DOCUMENT?

A. In response to a question about whether ComEd has consulted with other utilities with regard to data analytics, ComEd produced a benchmarking study that describes the approaches to data analytics found in seventeen different utility and non-utility enterprises.[88] That document examines three approaches to data analytics, labeled

[85] ComEd response to data request AG 7.10, Attach 1 Proprietary and Confidential (confidential designation removed by agreement).

[86] *Id*. at page 4.

[87] *Id*. at page 3.

[88] ComEd response to data request AG 6.28, Attach 1 (Confidential and Proprietary).

<< >[89] The benchmarking document discusses multiple approaches to selecting and evaluating data analytic solutions, as well as the role of budgeting and planning. A copy of this document is attached as AG Exhibit 2.6.

Q. WHAT HAS THE COMPANY DONE IN 2015 IN TERMS OF SOFTWARE MODIFICATIONS OR ENHANCEMENTS?

A. When asked, the Company indicated that its 2015 software projects were evaluated on a project-by-project basis.[90] The Company highlights a number of data related accomplishments in its 2016 AIPR.[91] These projects include system releases and expansion of the Company's Outage Management System.[92] Other initiatives include expanding the Company's Meter Data Management System to improve bill accuracy and operational performance.[93] This approach, in and of itself, may be appropriate to maintain and modify existing software needs as evidenced in the original in-service date of on-premise solutions, some dating as early as 1998.[94] But it appears that the Company's 2015 software projects have provided only incremental enhancements to existing software systems, rather than innovative functions and solutions.[95]

Q. ARE THERE EXAMPLES WHERE THE COMPANY HAS CONSIDERED AND RULED OUT CLOUD COMPUTING SERVICES IN FAVOR OF ON-PREMISE SOLUTIONS?

[89] *Id*. at 8.
[90] ComEd response to data request AG 7.05 part c.
[91] 2016 AIPR. Page 23.
[92] 2016 AIPR. Page 23.
[93] 2016 AIPR. Page 26.
[94] ComEd response to data request AG 7.05 part d.
[95] ComEd response to data request AG 7.05 part a.

A. Yes, for example the Company has chosen to manage its peak time rebate program through the use of existing off-the-shelf licenses and desktop applications.[96] The existing licensing tool forecasts peak events and incorporates a data visualization tool already in use by the Company.[97] The tool itself appears to be a dashboard that visualizes information for users.[98] The Company has not indicated how it optimizes the information to determine peak time rebate days based on the interrelationship between its customers and the ComEd system and the overall PJM system. Ideally, a peak time rebate program should be coincident to both the ComEd system peak and the PJM peak in order to have a meaningful impact. The Company has not indicated how or if its peak time rebate program with the Qlikview visualization software will anticipate system peaks.

Q. IS IT IMPORTANT THAT THE COMPANY'S DATA ANALYTICS AND CLOUD BASED SOLUTION INVESTMENTS ARE PART OF AN OVERALL INFORMATION TECHNOLOGY STRATEGY?

A. Yes. As demonstrated by ComEd's sister utility BGE, comprehensive business intelligence and data analytics solutions are currently available to address a wide range of utility needs, including customer service, revenue protection, operations, and predictive maintenance. In fact, BGE won the "Smart Grid Project of the Year" award for its Energy Smart Grid applications in 2015. According to a press release, BGE adopted data analytics technology to address energy theft, meter malfunction and revenue protection generally.[99] See AG Exhibits 2.7 and 2.8. As noted previously, McKinsey and Company

[96] ComEd response to data request AG 7.08.

[97] *Id.*

[98] http://www.qlik.com/solutions/industries/energy-and-utilities.

[99] http://www.businesswire.com/news/home/20150203005406/en/Baltimore-Gas-Electric-Wins-Project-Year-Deployment; See also AG Ex. 2.7.

provided a study on the Value of Grid Analytics for Exelon, referring to services offered by C3 IoT, showing $131 million of annual value for BGE and $221 million of annual value for ComEd, totaling $468 million in annual value to Exelon.[100] See AG Exhibit 2.9. The Company has not provided a roadmap or the specifics of how it is planning to incorporate data analytics to make its data "actionable." At this juncture, it is unclear whether ComEd's current investments in information technology and data analytics are still at the stage of pilots and niche analytic solutions. There does not appear to be overall strategy such as the one Exelon articulated in its Advanced Meter Infrastructure Business Intelligence/Data Analytics – *Functional Requirements* or described in the ComEd Benchmarking Study, attached as AG Exhibits 2.5 and 2.6, respectively. Given the extensive amount of data becoming available as a result of the modernization of its grid and deployment of AMI, the prudence and reasonableness of ComEd's expenditures on data analytics needs to be understood in light of ComEd's overall data analytics/ business intelligence approach. The Commission should ask whether ComEd has a specific, express strategy to modernize data analytics and business intelligence to complement its sizable investments to install smart meters and modernize its distribution system.

Q. WHAT DO YOU RECOMMEND?

A. We recommend that the Commission require ComEd to develop a long-term plan to fully utilize the extensive data that is becoming available due to the installation of smart meters and modern distribution infrastructure. A long-term plan is necessary to verify and encourage the development and integration of new data analytic strategies and solutions that would prudently complement the Company's multi-billion dollar investments to

[100] McKinsey and Company. *Value of Smart Grid Analytics for Exelon.* March 1, 2013. Available athttps://www.icc.illinois.gov/downloads/public/McKinsey%20-%20Exelon%20Smart%20Grid%20Analytics%20Value.pdf. Slide 8.

modernize its system and to complement its smart grid investments in order to achieve operational and consumer savings.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes.